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6. AUTHOR(S) Fred Haggar					
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13. ABSTRACT (Maximum 200 words) <p>Qualification tests were performed to determine whether the in-service Mk 14 Mod 3 Cartridge Tank could be utilized to contain properly dunnaged solid type hazardous materials weighing up to a gross weight of 18.6 kg (41 pounds). The tests were conducted in accordance with Performance Oriented Packaging (POP) requirements specified by the United Nations Recommendations on the Transportation of Dangerous Goods and the Department of Transportation's Title 49 CFR and the Final Rulings published in the Federal Register, Vol. 55 on 21 Dec 90. The tank has conformed to the POP performance requirements; i.e., the tank successfully retained its contents throughout the specified tests.</p> <p>In addition, due to their similarities in size and weight, this test is considered representative of qualification testing for the Mk 14 Mods 0, 1, 2 and Mk 15 Mods 0, 1 Cartridge Tanks as per the variation in the Federal Register (21 Feb 91) and page 52724, para 178.601h of the Final Rulings specified in the Department of Transportation's Performance Oriented Packaging Standards in the Federal Register, Vol. 55.</p>					
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**DODPOPHM/USA/DOD/NADTR91005 REVISION A**

Superseding  
DODPOPHM/USA/DOD/NADTR91005  
7 May 1991

**PERFORMANCE ORIENTED PACKAGING TESTING  
OF  
MK 14 MODS 0, 1, 2, 3 AND MK 15 MODS 0, 1 CARTRIDGE TANKS  
FOR  
PACKING GROUP II  
SOLID HAZARDOUS MATERIALS**

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8 August 1991

**FINAL**

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## INTRODUCTION

The Mk 14 Mod 3 Cartridge Tank tested, contained a simulated load of 41 pounds of sand. Overall weight of the tank was 46 pounds. This Performance Oriented Packaging (POP) test was performed to ascertain whether this standard container (Packing Group II) would meet the requirements as specified by the United Nations Recommendation on the Transportation of Dangerous Goods Document, ST/SG/AC.10/1, Revision 6, Chapters 4 and 9, and Federal Register 49 CFR Final Rule. A base level vibration test was also conducted in accordance with the final rulings specified in the Department of Transportation's Performance Oriented Packaging Standards in the Federal Register Volume 55.

The objective of these tests was to ensure that the sample container could withstand conditions of transportation outlined by the UN requirements. The test is representative of the worst case loading of the Mk 14 Mod 3 Cartridge Tank.

In addition, due to their similarities in size and weight, this test is considered representative of qualification testing for the Mk 14 Mods 0, 1, 2, and the Mk 15 Mods 0, 1 Cartridge Tanks as per the variation in the Federal Register (21 February 1991) and page 52724, paragraph 178.601h of the Final Rulings specified in the Department of Transportation's Performance Oriented Packaging Standards in the Federal Register, Volume 55.

## TESTS PERFORMED

### 1. Drop Test

This test was performed in accordance with ST/SG/AC.10/1, chapter 9, paragraph 9.7.3. Six tanks were used as required. The drops were performed from a height of 4 feet in the following orientations (three tanks for each orientation):

- a. Horizontally. (See figure 1.)
- b. Diagonally on the edge between the cover assembly and the top ring of the tank. (See figure 2.)

This test was performed at an ambient temperature,  $70 \pm 20$  °F.



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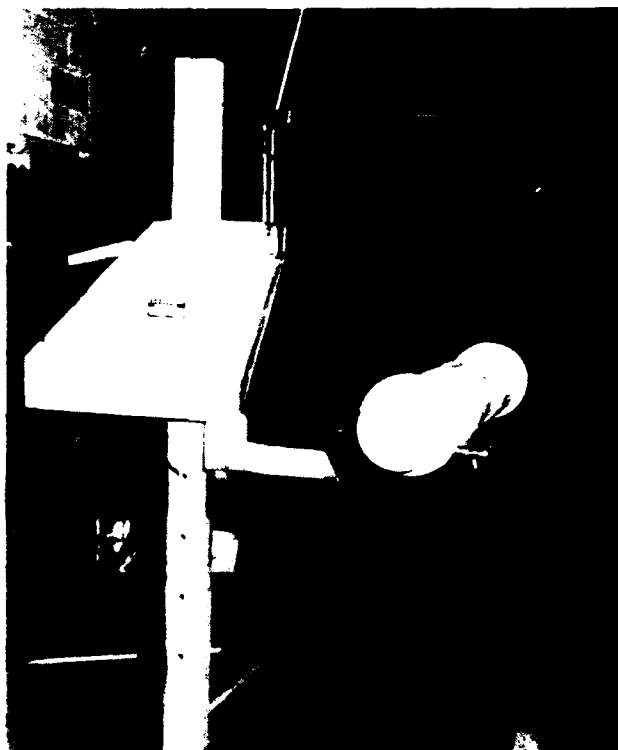


FIGURE 1  
Horizontal Drop Test



FIGURE 2  
Vertical Drop Test

## **2. Base Level Vibration Test**

This test was performed in accordance with paragraph 178.608 of the Performance Oriented Packaging Standards, Final Ruling, published in the Federal Register, Vol. 55, No. 246, December 21, 1990. The three sample tanks used for the horizontal drop tests were placed on the repetitive shock. The tanks were restrained during vibration in all but the vertical direction. The frequency of the platform was increased until the tank left the platform 1/16 of an inch at some instant during each cycle. Test time was 1 hour at a frequency of 4.17 Hz.

## **3. Stacking Test**

This test was performed in accordance with ST/SG/AC.10/1, chapter 9, paragraph 9.7.6. The three tanks used for the diagonal drop tests were used for this test. Each tank was subjected to a force applied to its top surface equivalent to the total weight of identical packages stacked to a height of 3 meters (including the test samples). A combined weight of 2,140 pounds was stacked on the three tanks (713 pounds/tank). The test was performed for 24 hours. After the allowed time, the weight was removed and the tanks examined.

## **PASS/FAIL (UN CRITERIA)**

### **1. Drop Test (UN CRITERIA)**

The criteria for passing the drop test is outlined in paragraph 9.7.3.5 of ST/SG/AC.10/1 and states the following: "Where a packaging for solids undergoes a drop test and its upper face strikes the target, the test sample passes the test if the entire contents are retained by an inner packaging or inner receptacle; e.g., a plastic bag, even if the closure is no longer sift-proof. A slight discharge from the closure(s) upon impact should not be considered to be a failure of the packaging provided that no further leakage occurs."

### **2. Base Level Vibration Test (FINAL RULING CRITERIA)**

The criteria for passing the base level vibration test is outlined in paragraph 178.608 of the Title 49 CFR Final Ruling and states the following: "immediately following the period of vibration, each package shall be removed from the platform, turned on its side and observed for any evidence of leakage. Rupture or leakage from any of the packages constitutes failure of the test."

### **3. Stacking Test (UN CRITERIA)**

The criteria for passing the stacking test is outlined in paragraph 9.7.6.3 of ST/SG/AC.10/1 and states the following: "... no test sample should leak. No test sample should show any deterioration which could adversely affect transport safety or any distortion liable to reduce its strength or cause instability in stacks of packages."

## **TEST RESULTS**

### **1. Drop Test**

Satisfactory.

### **2. Base Level Vibration Test**

Satisfactory.

### **3. Stacking Test**

Satisfactory.

## **DISCUSSION**

### **1. Drop Test**

After each drop, the tanks were inspected for any damage which would be a cause for rejection. The inspection after the horizontal drops indicated there was a cracked weld between the sleeve and the body of the tank, but no leakage was found. No leakage was found after the diagonal drops. The tanks remained intact and functional upon completion of the tests.

### **2. Base Level Vibration Test**

Immediately after the vibration test was completed, each tank was removed from the platform, turned on its side and observed for any evidence of leakage. There was no leakage to the tanks as a result of this test.

### **3. Stacking Test**

Each tank was visibly checked after the 24-hour period was over. There was no leakage, distortion, or deterioration to any of the tanks as a result of this test.

## **REFERENCE MATERIAL**

A. United Nation's "Recommendation on the Transportation of Dangerous Goods," ST/SG/AC.10/1, Revision 6

B. Title 49 CFR 107, et al., Performance Oriented Packaging Standard; Changes to Classification, Hazard Communication, Packaging and Handling Requirements Based on UN Standards and Agency Initiative; Final Rule, Federal Register, Vol. 55, No. 246 of December 21, 1990

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# TEST DATA SHEET

<b>DATA SHEET:</b>	
<b>Container:</b> Mk 14 Mod 3 Cartridge Tank	
<b>Type:</b> 1B2	<b>Container P/N or NSN:</b> NSN 8140-00-135-2866
<b>Specification Number:</b> MIL-STD-1323-5, DL 2127977	<b>Material:</b> Aluminum
<b>Gross Weight:</b> 20.9 kg (46 pounds)	<b>Dimensions:</b> 7.47" D x 36.33" L
<b>Closure (Method/Type):</b> Removable Cover	<b>Tare Weight:</b> 4.1 kg (5 pounds)
<b>Additional Description:</b> Mk 14 Mod 0 (Dwg 389112), Mod 1 (Dwg 2127872), Mod 2 (Dwg 2127964) Mk 15 Mod 1 (Dwg 423033)	
<b>PRODUCT:</b> See table	
<b>Name:</b> See table	<b>NSN(s):</b> See table
<b>United Nations Number:</b> See table	
<b>United Nations Packing Group:</b> II	
<b>Physical State (Solid, Liquid, or Gas):</b> Solid	
<b>Vapor Pressure (Liquids Only):</b> N/A <b>At 50 C:</b> N/A <b>At 55 C:</b> N/A	
<b>Consistency/Viscosity:</b> N/A	<b>Density/Specific Gravity:</b> N/A
<b>Amount Per Container:</b> See table	<b>Flash Point:</b> N/A
<b>Net Weight:</b> See table	
<b>TEST PRODUCT:</b> Simulated Weights of Sand	
<b>Name:</b> Sand	<b>Physical State:</b> Solid
<b>Consistency:</b> N/A	
<b>Density/Specific Gravity:</b> N/A	
<b>Test Pressure (Liquids Only):</b> N/A	
<b>Amount Per Container:</b> N/A	<b>Net Weight:</b> 18.6 kg (41 pounds)

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TABLE 1

## Mk 14 Mod 3 Cartridge Tank

NALC	NSN	Type	Packing Drawing	UN Code	UN Number	#/ Cntr	Weight (lb)
D297	1320-01-060-1118	Prop Chg Mk 68-2	2127977	1.2C	0328	1	27.0
D326	1320-01-004-1082	Prop Chg Full, Mk 67-3	2127977	1.2C	0242	1	41.0

## Mk 15 Mod 3 Cartridge Tank

NALC	NSN	Type	Packing Drawing	UN Code	UN Number	#/ Cntr	Weight (lb)
D282	1320-00-039-2058 (Non-Flashless)	Chg. Prop. 5"/38 Cal Full	423033		0242		28.6
	1320-01-157-2494 (Non-Flashless)	Chg. Prop. 5"/38 Cal Full					
D274	1320-00-039-2037	Chg. Prop. 5"/38 Cal Full	423033		0242		41.2
	1320-00-131-4930 (Flashless)	Chg. Prop. 5"/38 Cal Full					
	1320-00-174-4174 (Flashless)	Chg. Prop. 5"/38 Cal Full					
	1320-01-009-1861 (Flashless)	Chg. Prop. 5"/38 Cal Full Mk 63 Mod 1					
D272	1320-00-039-1971 (Non-Flashless)	Chg. Prop. 5"/38 Cal Full	423033		0242		40.2
	1320-00-467-2577 (Non-Flashless)	Chg. Prop. 5"/38 Cal Full Mk 63 Mod 1					
	1320-00-667-0928 (Non-Flashless)	Chg. Prop. 5"/38 Cal Full					
	1320-00-667-0931 (Non-Flashless)	Chg. Prop. 5"/38 Cal Full Mk 63 Mod 2					

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**MK 14 MODS 0, 1, 2, 3 CARTRIDGE TANK  
AND  
MK 15 MODS 0, 1 CARTRIDGE TANK  
POP MARKING**

**UN 1B2/Y21/S/\*\*/USA/DOD/NAD**

**\*\* YEAR LAST PACKED OR MANUFACTURED**

**Encl (2)**